Preliminary Studies on the Effects of Gamma Irradiation of Eggs and Adults of the Southern Green Stink Bug, *Nezara viridula* (L.)[1]

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Since the accidental introduction into Hawaii of the southern green stink bug *Nezara viridula* (L.) in 1961, considerable work has been conducted to develop control measures. With the increased interest in eradication programs utilizing the sterile insect technique, information on the effects of irradiation of pentatomid insects was investigated and found to be scarce. However, many studies have been done on irradiation effects of another hemipterous insect *Rhodnius prolixus* (O'Brien and Wolfe, 1964). For this reason a series of experiments was initiated to determine the insect's tolerance to gamma radiation. This paper is a report of the effects of gamma irradiation of the egg and adult stages.

PROCEDURES AND METHODS

The eggs and adults used in the experiments were obtained from a laboratory culture. Egg masses were collected daily and kept in separate containers until exposed to Cobalt-60 radiation. The adults were not more than a week old at the time of treatment.

Irradiation was conducted at the Cobalt-60 Hawaii Research Irradiator. Since replicated dosages were required, a chamber rack was used. The rack consisted of five shelves with each shelf having fixed vial positions. Dosages received at each position were calculated from a standard dosimetry using standard Cobalt-60 decay coefficients. At the lower dosages the high rate of gamma ray emission of the unit made accurate dosage measurement difficult because of the variation in the travel dose for the shelf unit.

RESULTS AND DISCUSSION

Egg Irradiation.—Six age groups of southern green stink bug egg masses ranging from fresh to 5-days-old were exposed to varying dosages of gamma

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radiation. The age groups included fresh (eggs less than 1-day-old), 1-day-old, 2-day-old, 3-day-old, 4-day-old, and 5-day-old egg masses. Each egg group was replicated 3 times, with the exception of 4-day-old eggs, which was replicated twice. The average number of eggs treated in each egg group was 304 with a range of 287 to 382. The mean % hatch was calculated for each of the egg groups, and the results are presented in Table I.

TABLE I. *Effect of gamma radiation on mean percent hatch of six age groups of southern green stink bug eggs**

Dosage (rads)	Mean Percent Hatch					
	Fresh	1-day	2-day	3-day	4-day	5-day
Control (0 rad)	83.7	74.8	87.6	71.5	65.3	93.7
150	56.8	72.6	—	—	—	—
250	35.0	61.3	64.1	65.5	68.5	83.5
500	00.0	43.1	61.6	54.7	75.4	88.5
750	00.0	2.9	2.3	48.4	68.4	83.5
1000	00.0	00.0	00.0	0.8	58.8	87.0
2500	—	—	—	—	9.0	80.5
5000	—	—	—	—	00.0	53.5

*Average number of eggs was 304

Percent hatch of the untreated controls ranged from 65.3 to 93.7. The % hatch of the untreated eggs was generally higher than those of the treated.

Exposure to dosages of 500 rads or greater prevented hatch of any eggs less than 1 day old. For eggs 1–5 days old, a direct relationship between % hatch and increase in egg age occurred at a given radiation dosage. For example, Table I shows that a radiation dosage of 750 rads resulted in zero or very low hatch in the first 3 age groups; 48.4% hatch in the 4th age group, 68.5% in the 5th age group and 83.5% hatch in the last age group.

For a given egg age group, an inverse relationship between % hatch and irradiation dosage occurred. In the experiment on fresh eggs, it was found that 83.7% of the untreated eggs hatched as compared to 56.8% in the 150 rad treatment, 35.0% in the 250 rad treatment, and no hatch in the 500 rad treatment.

Adult Irradiation.—Three replications of 10 stink bugs (5 of each sex) each were irradiated with dosages of 5, 10, 20, 50, and 100 kilorads. No immediate mortality occurred at any dosage. Complete mortality in the 100 kilorad treatment occurred within 6 days after treatment while 9 days were required for complete mortality in the 50 kilorad treatment. A longer period of time was required for complete mortality in the other 3 treatments.

No mating was observed to occur among the insects treated with 10 kilorads or higher. Mating did occur between 2 females and 1 male in 1

replication of the 5 kilorad treatment; however, no egg masses were deposited.

Adults treated with 10 kilorads or higher were sluggish, and body tremors were observed among the stink bugs treated with 20 kilorads or more.

LITERATURE CITED

O'Brien, R.D. and L.S. Wolfe. 1964. Radiation, radioactivity and insects. Academic Press, New York.